Early Midcourse

MSX Instrumentation

SPIRIT III, UVISI, SBV, and Beacon Receiver

Objectives

The goal of the Early Midcourse team is to perform functional demonstrations and target signature data collections in support of a surveillance sensor viewing the Early Midcourse phase of ballistic missile flight.

Description

The main focus is two dedicated target missions. In both, a STARS missile launched from the Kauai Test Facility places a post-boost vehicle with 26 target objects on a trajectory with impact near USAKA. The MSX satellite will observe the targets during their deployments and midcourse trajectories, collecting data for functional demonstrations of a midcourse surveillance sensor and establishment of a data base of early midcourse target signatures in support of MSX objectives.

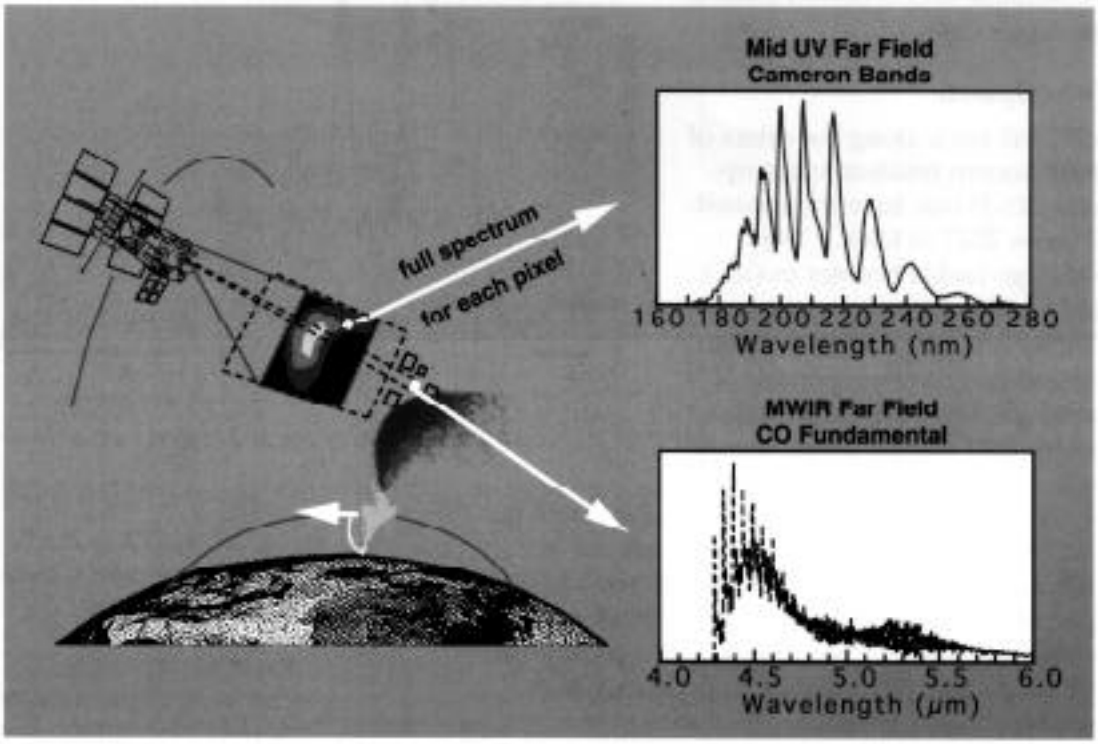
Science Opportunities

The opportunities for advancing scientific understanding in the Early Midcourse experiments derive primarily from MSX observations of rocket exhaust plumes. Data will be collected on the fundamental mechanisms that give rise to ultraviolet, visible, and infrared radiation from high-altitude, high-velocity exhaust plumes. By studying the spatial intensity distributions and the spectral distributions of molecular radiation in these plumes as a function of the relative collision velocities of plume and atmospheric species, fundamental information can be obtained regarding the nature and rates of these processes.

Principal Investigator

Glenn Light,
Aerospace Corporation

For more information, contact:
Space Department
Tel: (301) 953-6050
Fax: (301) 953-1093
The Johns Hopkins University
Applied Physics Laboratory
Johns Hopkins Road
Laurel, Maryland 20723-6099



Space Surveillance

MSX Instrumentation

SBV, SPIRIT III, and UVISI

Objectives

MSX will provide unique opportunities to observe man-made debris in Low Earth Orbit (LEO) and Geosynchronous Orbit (GEO) by searching known debris streams for unknown objects, observing the dispersal of fragments after the catastrophic destruction of a resident space object, and detecting objects that may be on or close to collision orbits with MSX. Above an altitude of 500 km, knowledge of man-made orbital debris is incomplete for debris 10 to 30 cm in diameter and largely unknown at less than 10 cm diameter. MSX will orbit at 900 km, where current models predict the greatest amount of man-made debris in LEO. The figure shows the distribution of the objects ≥10 cm in diameter currently tracked by the U.S. Space Command. The existing model assumes that the distribution of smaller objects throughout LEO is proportional to the larger ones.

Description

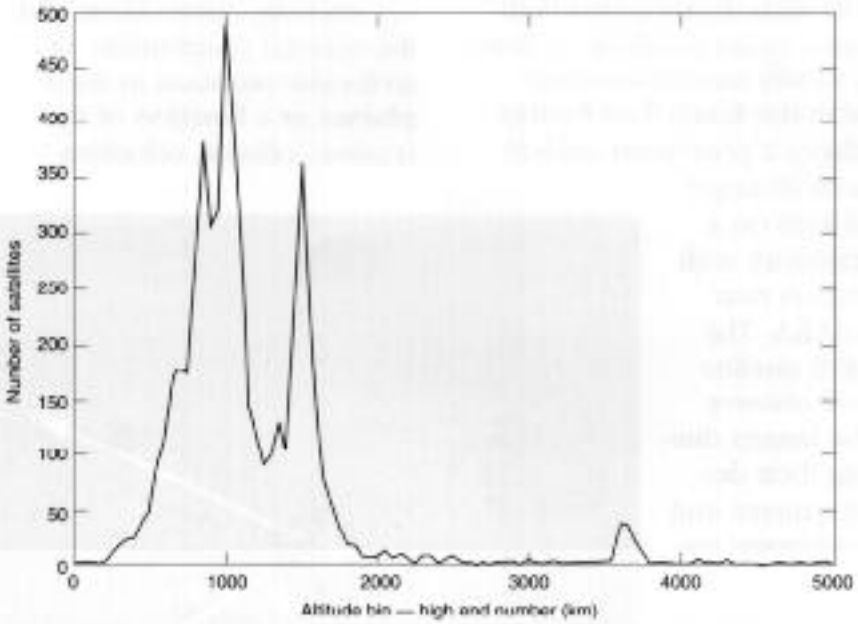
MSX will track along the orbits of three known resident space objects (RSO) that have fragmented: Cosmos 2227 in LEO, a Titan transtage rocket booster in GEO, and Cosmos 1278 in a geotransfer (highly eccentric) orbit. A search around these known objects while tracking at the rate of the parent RSO should permit identification of debris pieces generated by the fragmentation. Multi-spectral data from the SBV, SPIRIT III, and UVISI instruments can be combined to yield information about the albedo (percent reflectivity) and size of the object. These results will address the existence of radar-transparent debris and provide data to update existing models at these altitudes.

When the fragmentation of an object occurs, the SBV and UVISI instruments will track the dispersing pieces during the days-to-months after the fragmentation. The dynamics of the fragmentation can then be studied, yielding information about the cause of the event.

Limited measurements of the on-orbit flux of debris onto a given space platform have been made. The SBV can search in preferential locations from which the current model predicts most of the orbital debris will come. Objects seen in specific directions over a given time period will be counted. The data will contribute to the design of specific strategies for early warning of debris collision.

Principal Investigator

Michael Gaposchkin, MIT/Lincoln Laboratory



Distribution of tracked objects with altitude.

For more information, contact:
Space Department
Tel: (301) 953-6050
Fax: (301) 953-1093
The Johns Hopkins University
Applied Physics Laboratory
Johns Hopkins Road
Laurel, Maryland 20723-6099